FINAL SYNOPSIS

of the thesis entitled

"ECOBIOLOGY OF FRESHWATER BRYOZOA & SPONGES OF KAGZIPURA AND MOMBATA RESERVOIR".

To be submitted

To

The Faculty of Science

Dr. Babasaheb Ambedkar Marathwada Univserity

Aurangabad (M.S.)

(NAAC Acrredited at 'A' Level)

FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ZOOLOGY

By

Ms. Nirmiti D. Nimbalkar

Research Student

Under the Guidance of

Dr. Ramesh P. Chondekar

Associate Professor

Department of Zoology

Dr. Babasaheb Ambedkar Marathwada Univserity

Aurangabad (M.S.)-421004.

INTRODUCTION

Ecobiology is the study of inter-relationship between the organisms with their environment. Aquatic habitat is a home of number of wide variety of organisms wherein the physico-chemical parameters are regulating their population within that habitat. Study of ecobiology will be helpful to get the idea about fruitful and harmful conditions for the living organisms so that the information will be helpful to culture the commercial as well as ecologically significant organism. Secondly, it will help to monitor the particular ecosystem by comparing the status of ecosystem with the previous one.

Freshwater Bryozoa are also named as Ectoprocta, Moss animal or Polyzoa but basically these are aquatic invertebrate and can be found on variety of submerged substratum such as wood, glass, rocks, metal cans, rubber, macrophytes etc (Swami *et.al*, 2016). They are categorized into three different clades including, Phylactolaemata, Gymnolaemata, Stenolaemata (Mukai 1982; Francis 2001). Among these classes, Phylactolaemata is exclusively freshwater wherein most of the Gymolaemata except subclass are marine except Ctenostomata and all Stenolaemata are marine species. (Wood, 2010). They reproduce asexually by producing a dormant fruiting body called "statoblast" and sexually by producing gametes. Species identification is done by studying the surface microstructure of the statoblast and colony features (Swami *et. al*, 2016). The detailed micro-ornamentation could be clearly revealed in Scanning Electron Microscope (SEM) (Wood and Lore, 2005).

The freshwater bryozoan has significant role in ecosystem as it is a part of food chain and serve as a food for other invertebrates and vertebrates (Wood, 2005) they aid in the flow of organic materials (Vohmann *et al*., 2009) so can be used in wastewater treatment and as a bioindicator (Nimtim *et al*, 2020). Certain marine

species are well known for their bioactivity against cancer or tumor (Massard and Geimer, 2008; Pejin *et. al*, 2013) wherein some freshwater species are also claimed for presence of bioactive molecules which can be used against different pathogens as well as tumor (Kollar *et. al*, 2016). Apart from this, these animals also has dark side as few of the species are neurotoxic in nature which can kill the fishes, some are acting as a host for myxozoan parasite which causes Proliferative Kidney Disease (PKD) in salmonids and decreasing the farmed fish population and they are common fouling animals which can block the water pipelines occasionally. Despite their widespread distribution, its ecological and commercial importance and harmful effects, little is known about bryozoans' zoogeographical status. In India pioneering work is carried out by Annandale (1911) and after him Rao (1992) has given distribution of this group in central India. Whatsoever studies that are carried out are restricted to central and eastern parts of India, therefore, it is essential to understand the diversity and distribution of this group. Previously *Plumatella* was recorded by Annandale from Igatpuri reservoir in 1911 some 100 years ago thereafter no work is reported on this group in Maharashtra state. Understanding the diversity and distribution of this group will add important data in freshwater biota of this region.

On the other hand, sponges are aquatic, sessile filter-feeding invertebrates. The number of freshwater species of sponges in the world is about 100 among of them only 31 species (11 genera) occurs in India (Soota, 1991). Fresh water sponges provide a good experimental model for studying biochemical pathways since it is possible to develop them in vitro conditions starting from gemmules, the resting bodies of sponges (Lopp *et al.*, 2007). In India, Annandale established the new ground for this group after which no considerable work was undertaken for more than half a century (Annandale, 1909, 1911, 1915). The sponges are in great commercial demand

as some of them are good sources of bath sponges for cosmetic industry (Josupeit, 1990). Some sponges are also acting as a marine anti biofouling agent (Periera *et al*., 2002). They have become the center of biochemical studies due to the presence of novel compounds and bioactive secondary metabolites which turn out to be a cure for many diseases, including cancer (Longakit *et al*., 2005). According to World Porifera Database, 8517 species of sponges are valid but the knowledge on sponge biodiversity is still largely incomplete (Van Soest *et al*., 2014). However, it is believed that there could be more species.

Data on occurrence and diversity of freshwater bryozoans and sponges of Kagzipura and Mombata reservoir has reported earlier (Mokashe and Harkal, 2013; Harkal and Mokashe, 2015; Swami *et.al*, 2016; Harkal and Mokashe, 2018). But still the ecobiological aspect of these animals of this region was not studied yet. According to Swami *et.al*, 2016, reassessment of these reservoirs has high probability of encountering additional new species and we were optimistic that even more species will eventually be revealed in this region. On the basis of this ground we had undertaken the present work and not only updated the species composition of these sites but also revealed the fluctuation in species diversity according to hydrological parameters. This data has provided the optimum conditions at which these invertebrates can survive and could be beneficial to rear these invertebrates in laboratory conditions. This will be also helpful to monitor the health of freshwater ecosystem from time to time which is essential for its conservation.

CHAPTER- SCHEME OF PROPOSED THESIS WORK:

1: Introduction

2: Review of Literature

3: Methodology

4: Results and Discussion

5: Conclusion

REVIEW OF LITERATURE

This chapter includes literature survey of different aspects of freshwater bryozoans and sponges including diversity, distribution, taxonomy, development, culture, bioactivity, ecology.

METHODOLOGY

Collection of Samples

- Sampling was done at Kagzipura reservior ($19^0$58'16" N, $75^0$12'31"E) and Mombata reservoir ($19^0$57'N & $75^0$15'E) for the period of two years.
- Plankton samples, biological samples i.e. submerged substrata having bryozoan colonies and sponges were collected in different labeled bottles.
- Thermometers, digital pH meter and TDS meter were used to study water parameters such as temperature, pH, and total suspended solids.
- Various chemical testing were carried out on the collected water sample for further analysis.
- Rainfall, humidity and atmospheric temperature data of both of the study area was collected from authorized center.

Laboratory investigations:

- Collected plankton and substrata were observed under light microscope and images were captured by using eye-piece camera.

- Remaining parameters of water samples including dissolved oxygen, free carbon dioxide, primary productivity, total alkalinity, calcium hardness, magnesium hardness, total hardness, chlorinity, biological oxygen demand, phosphate, sulphate and nitrate were also reported (APHA, 1998 and Trivedi and Goael, 1984).

Taxonomical identification

- FE-SEM of fruiting bodies i.e. statoblasts and gemmules, and spicules of sponges were done from Central Facility Centre, Savitribai Phule Pune University. Taxonomical identification was done on the basis of SEM images and with the help of standard keys of freshwater Bryozoa and sponges Annandale (1911), Soota (1991), Wood (2006; 2010).

Statistical analysis

- With various statistical tools, the analysis of the interaction between water parameters and species diversity was studied as per the standard protocol mentioned in Biostatistical analysis by Mungikar, 2003 and by using SPSS software.

WORK DONE

- Collection of plankton samples, biological samples and water samples was done at the study area between July 2018 to March 2020, twice in a month.
- Estimation of physico-chemical parameters of water sample was done.
- Metrological data was recorded from July 2018 to June 2020**.**
- Taxonomical identification was done on the basis of FE-SEM images and standard keys.
- The data of species diversity and physico-chemical parameters was statistically analyzed.

RESULT AND DISCUSSION

- We have encountered with the six bryozoan species i.e. *Plumatella vorstmani* (Toriumi, 1952), *Plumatella casmiana* Oka, 1907, *Lophopodella carteri* Hyatt, 1868, *Swarupella divina* Wood, 2006, *Plumatella bombayensis* Annandale, 1908, *Hyalinella lendenfeldi* (Ridley, 1886) from Kagzipura and five species including *Plumatella casmiana*, *Plumatella vorstmani*, *Plumatella bombayensis*, *Swarupella divina* and *Hislopia malayensis* Annandale, 1916 from Mombata reservoir.
- Two species of sponges were encountered from Kagzipura including *Stratospongilla bombayensis* (Carter, 1882), *Eunapius Carteri* (Bowerbank, 1863). Wherein at Mombata in addition to *Stratospongilla bombayensis* and *Eunapius Carteri*, *Corvospongilla lapidosa* (Annandale, 1908) were also observed.
- Diversity of Bryoza and Sponge were fluctuating according to the change in the physico-chemical parameters of water at both the study area and it is statistically analyzed.
- Data on diversity of both these invertebrates was reported from both the study area but present study has added and updated the bryozoan and sponge species diversity at the study area. It has also revealed that the interaction between the physico-chemical parameters of water and fluctuation in species diversity which was not studied earlier.

CONCLUSION

- In present study ecobiology of Bryozoa and Sponges of the study site i.e. Kagzipura and Mombata was studied and it is concluded that the diversity of

both of these species was fluctuating according to fluctuation in the physico-chemical parameters which is a baseline data and will be helpful to monitor the health of freshwater ecosystem from time to time which will be useful for its conservation. Apart from ecobiological aspect, present work has also updated the species diversity of both of these invertebrate at both of the study sites which is adding the valuable data in the fauna of the study sites.

Research Student

Ms.Nirmiti D. Nimbalkar

Research guide

Dr. Ramesh P. Chondekar
(Asso. Professor)

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